cond A10

processor generates data quads encapsulating the information.--

CONCLUSION

The application has been amended to put it in better form for examination. The equations have been revised to correct typographical errors and to conform with the equations disclosed in the provisional application which was incorporated by reference in the application as filed. No new matter is being introduced by this amendment and it is respectfully requested that the above amendment be considered when the application is examined on its merits.

This amendment is believed to conform the application to the attached specification attached to the Declaration for Patent Application filed concurrently herewith in response to the Notice to File Missing Parts dated December 10, 2001 in this application.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE IN THE SPECIFICATION:

1. Paragraph 00051 beginning on page 19, replace the paragraph as follows:

The sampled output of the k^{th} sub-aperture in the receiver system may be denoted $V_{Rx}(k, t_n)$. Motion compensation functions 318, 328, and 338 may remove time dependent phase delays between the transmitter and receiver system. Motion compensation may be performed for each receiver sub-aperture independently. Because the received signal is a composite of transmitted signals, a single point on the transmitter, such as transmitter 200, may be motion compensated. The transmitter may be known as the j_0^{th} transmitter sub-aperture. To simplify the derivations, a scaling also may be included in motion compensation functions 318, 328, and 338. The scale factor may be the inverse of the transmitted signal strength. The signal strength may be proportional to the square-root of the transmitter power delivered to the j_0^{th} transmitter sub-aperture. The motion compensated signal may be given by:

$$[\; X_k(t) \equiv \frac{V_{RX}(k,t)}{V_{Tx}(t)} e^{-2\pi i f(t-\tau(\overline{x}_{Tx\,:\,j0}(t) - \overline{x}_{RX\,:\,k}(t)))} \;]$$

$$\underline{X_k(t) \equiv \frac{V_{Rx}(k,t)}{V_{Tx}(t)} e - 2\pi i f(t - \tau(\overline{X}_{Tx\,:\,j_0}(t) - \overline{X}_{Rx\,:\,k}(t)))}$$

where f is the center frequency of the transmitted signal, and,

[$\tau\left(\overline{x}_{Tx\,:\,j0}(t) - \overline{x}_{Rx\,:\,k}(t)\right)$] $\underline{\tau(\overline{X}_{Tx\,:\,j0}(t) - \overline{X}_{Rx\,:\,k}(t))}$ is the signal propagation delay from the j_0th transmitter sub-aperture to the kth receiver sub-aperture. For example, transmitter sub- aperture 210 may send a signal to receiver sub-aperture 310 that is motion compensated. The above algorithm discloses the motion compensation operation performed by motion compensation function 318.

2. Paragraph 00054 beginning on page 21, replace the paragraph as follows:

Waveform compensation may be initialized and/or updated once per coherent processing interval. The coherent processing interval is chosen such that the number of signal samples is greater than or equal to J, [#] or the number of transmitter sub-apertures, times M, or the number of delay values desired to cover the ground clutter grid. A waveform compensation filter computation function 408 may generate and format an [N_t x (J·M)] $\underline{N_t \times (J\cdot M)}$ array of delayed reference signals, where N_t may be the number of samples in a coherent processing interval. The reference signal data, $s_j(t_n - \tau_m)$, associated with the mth delay for the jth transmitter sub-aperture is mapped into the qth column, where $q(j,\mu) = \mu + (j-1)\cdot M$. The inverse map of the generalized index, q, into the sub-aperture index, j, and the delay index, μ, may be given by:

$$\mu \equiv \mathrm{mod}(q, M)$$
$$j \equiv \mathrm{floor}\left(\frac{q}{M}\right)$$

3. Paragraph 00055 beginning on page 22, replace the paragraph as follows:

For the coherent processing interval starting with the time sample t_{n0}, the array of delay-compensated reference data may be given by:

[$\sum n,q(n_0) \equiv s_{j(q)}(t_n - \tau_{\mu(q)})$] $\underline{\Sigma_{n,q}(n_0) \equiv s_{j(q)}(t_n - \tau_{\mu(q)})}$

$\underline{\text{where } n \in [n_0, n_0 - N_t - 1] \text{ and } q \in [1, J\cdot M\text{-}1]}$

4. Paragraph 00056 beginning on page 22, replace the paragraph as follows:

The term also may be written in terms of [$\tilde{S}_{j,n} \equiv S_j(t_n)$] $\underline{\tilde{S}_{j,n} \equiv S_j(t_n)}$. Because $t_n - \tau_{\mu(q)} = t_{n-\mu(q)}$ and $S_j(t_n - \tau_\mu) = \tilde{S}_{j,n-m}$, the array of delay-compensated reference may be given by:

[

$$\Sigma(n0) \equiv \left(\begin{array}{cccc|cccc|c|cccc} \tilde{S}0,n_0 & \tilde{S}0,n_0-1 & \cdots & \tilde{S}0,n_0-M+1 & \tilde{S}1,n_0 & \tilde{S}1,n_0-1 & \cdots & \tilde{S}0,n_0-M+1 & \cdots & \tilde{S}J,n_0 & \tilde{S}J,n_0-1 & \cdots & \tilde{S}J,n_0-M+1 \\ \tilde{S}0,n_0-1 & \tilde{S}0,n_0-2 & \cdots & \tilde{S}0,n_0-M & \tilde{S}1,n_0-1 & \tilde{S}1,n_0 & \cdots & \tilde{S}0,n_0-M & \cdots & \tilde{S}J,n_0-1 & \tilde{S}J,n_0 & \cdots & \tilde{S}J,n_0-M \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \tilde{S}0,n_0+Nt-1 & \tilde{S}0,n_0+Nt-2 & \cdots & \tilde{S}0,n_0+Nt-M & \tilde{S}1,n_0+Nt-1 & \tilde{S}1,n_0+Nt-2 & \cdots & \tilde{S}0,n_0+Nt-M & \cdots & \tilde{S}J,n_0+Nt-1 & \tilde{S}J,n_0+Nt-2 & \cdots & \tilde{S}J,n_0+Nt-M \end{array}\right)$$

]

$$\underline{\sum(n_0) \equiv \left(\begin{array}{cccc|cccc|c|cccc} \tilde{S}_{0,n_0} & \tilde{S}_{0,n_0-1} & \cdots & \tilde{S}_{0,n_0-M+1} & \tilde{S}_{1,n_0} & \tilde{S}_{1,n_0-1} & \cdots & \tilde{S}_{0,n_0-M+1} & \cdots & \tilde{S}_{j-1,n_0} & \tilde{S}_{j-1,n_0-1} & \cdots & \tilde{S}_{j-1,n_0-M+1} \\ \tilde{S}_{0,n_0-1} & \tilde{S}_{0,n_0-2} & \cdots & \tilde{S}_{0,n_0-M} & \tilde{S}_{1,n_0-1} & \tilde{S}_{1,n_0} & \cdots & \tilde{S}_{1,n_0-M} & \cdots & \tilde{S}_{j-1,n_0-1} & \tilde{S}_{j-1,n_0} & \cdots & \tilde{S}_{j-1,n_0-M} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \tilde{S}_{0,n_0+N_t-1} & \tilde{S}_{0,n_0+N_t-2} & \cdots & \tilde{S}_{0,n_0+N_t-M} & \tilde{S}_{1,n_0+N_t-1} & \tilde{S}_{1,n_0+N_t-2} & \cdots & \tilde{S}_{0,n_0+N_t-M} & \cdots & \tilde{S}_{j-1,n_0+N_t-1} & \tilde{S}_{j-1,n_0+N_t-2} & \cdots & \tilde{S}_{j-1,n_0+N_t-1} \end{array}\right)}$$

5. Paragraph 00061 beginning on page 23, replace the paragraph as follows:

Then, the array of compensated reference signals may be given by:

$$[\Sigma n,q(n_o) \equiv e^{2\pi i f v(q)(tn-\tau_{\mu(q)})} S_{j(q)}\left(tn - \tau_{\mu(q)} - \frac{\lambda f_{v(q)}}{C_{light}}(t_n - \tau_{\mu(q)})\right)]$$

$$\underline{\Sigma_{n,q}(n_o) \equiv e^{2\pi i f_{v(q)}(t_n-\tau_{\mu(q)})} S_{j(q)}\left(t_n - \tau_{\mu(q)} - \frac{\lambda f_{v(q)}}{C_{light}}(t_n - \tau_{\mu(q)})\right)}$$

where $n \in [n_0, n_0 + N_t - 1]$ and $q \in [1, J \cdot M \cdot N\text{-}1]$.

6. Paragraph 00062 beginning on page 24, replace the paragraph as follows:

For the k^th^ receiver system sub-aperture, H is a vector of length J·M·N. Vector H may be reformatted into a [Jx(MxN)] <u>J×(M×N)</u> array where the j^th^ element discloses the dependence of the channel transfer function on transmitter sub-array degrees of freedom and (μ,v) discloses the delay and doppler dependence.

7. Paragraph 00082 beginning on page 32, replace the paragraph as follows:

Step 708 executes by linearizing the phase delay of the BCTF. Linearization of the phase delay in the BCTF may demonstrate the dependence on doppler and the bearing of transmitter 200 and receiver 300 to the clutter patch, or

$$\varphi_{c:jk}(\bar{x}_c, t) = \varphi_0 + K^T \circ D_p$$

where

[$$D_p = \begin{bmatrix} {}^{d}Tx\left[\sin({}^{\varphi}Tx\_c) + \sin({}^{\varphi}Tx\_Rx)\right] \\ {}^{d}Rx\left[\sin({}^{\phi}c\_Rx + {}^{\eta}Rx) - \sin({}^{\phi}Tx\_Rx + {}^{\eta}Rx)\right] \\ {}^{V}Tx\left[\sin({}^{\phi}Tx\_c) + \sin({}^{\phi}Tx\_Rx)\right]\delta t_{nyquist} + {}^{V}Rx\left[\sin({}^{\phi}c + Rx) - \sin({}^{\phi}Tx\_Rx)\right]\delta t_{nyquist} \end{bmatrix}$$]

$$D_p = \begin{bmatrix} d_{Tx}\left[\sin(\phi_{Tx\_c}) + \sin(\phi_{Tx\_Rx})\right] \\ d_{Rx}\left[\sin(\phi_{c\_Rx} + \eta_{Rx}) - \sin(\phi_{Tx\_Rx} + \eta_{Rx})\right] \\ V_{Tx}\left[\sin(\phi_{Tx\_c}) + \sin(\phi_{Tx\_Rx})\right]\delta t_{nyquist} + V_{Rx}\left[\sin(\phi_{c\_Rx}) - \sin(\phi_{Tx\_Rx})\right]\delta t_{nyquist} \end{bmatrix}$$

8. Paragraph 00083 beginning on page 33, replace the paragraph as follows:

Step 710 executes by absorbing the constant phase term into the relative strength of the scattered signal, or $A_{c:j,k}$. Thus, the BTCF may be given by

[$$H_{c:j,k}(\tau, t) \equiv \int_{[\Delta\tau_c(\bar{x}_c) = \tau]} e^{-iK^{T \circ D_P}} A_{c:j,k(\bar{x}_c, \bar{x}_{Tx}, \bar{x}_{Rx})} d^2\bar{x}_c$$]

$$H_{c:j,k}(\tau, t) \equiv \int_{[\Delta\tau_c(\bar{x}_c) = \tau]} e^{-iK^{T} \bullet D_P} A_{c:j,k}(\bar{x}_c, \bar{x}_{Tx}, \bar{x}_{Rx}) d^2\bar{x}_c$$

9. Paragraph 00087 beginning on page 34, replace the paragraph as

follows:

Step 718 executes by generating a linear system model for the signal model. The linear system model may be expressed as

$$
\left[\begin{pmatrix} Y(0) \\ Y(1) \\ \vdots \\ Y(N-1) \end{pmatrix} = \sum \circ \begin{pmatrix} H_{0,0} \\ H_{0,1} \\ \vdots \\ H_{0,M-1} \\ H_{1,0} \\ H_{1,1} \\ \vdots \\ H_{1,M-1} \\ \bullet\bullet\bullet \\ \hline H_{J-1,0} \\ H_{J-1,1} \\ \vdots \\ H_{J-1,M-1} \end{pmatrix} + \begin{pmatrix} \nu(0) \\ \nu(1) \\ \vdots \\ \nu(N-1) \end{pmatrix} \right]
$$

$$
\begin{pmatrix} Y(0) \\ Y(1) \\ \dots \\ Y(N-1) \end{pmatrix} = \sum \circ \begin{pmatrix} H_{0,0} \\ H_{0,1} \\ \dots \\ \underline{H_{0,M-1}} \\ H_{1,0} \\ H_{1,1} \\ \dots \\ \underline{H_{1,M-1}} \\ \dots \\ \hline H_{J-1,0} \\ H_{J-1,1} \\ \dots \\ \underline{H_{J-1,M-1}} \end{pmatrix} + \begin{pmatrix} \nu(0) \\ \nu(1) \\ \dots \\ \nu(N-1) \end{pmatrix}
$$